

ITEM	DESCRIPTION	UNIT
217001-*	SPECIAL ROCK FILL	CUBIC YARD (METER)

*Sequence number

SECTION 218 SLOPE AND FOUNDATION PROTECTION

218.1-DESCRIPTION:

This work shall consist of the construction of revetments of stone or concrete, with or without engineering fabric, to prevent erosion of slopes or banks, or to protect foundations, at places indicated on the Plans or where designated by the Engineer, all in accordance with these Specifications and in reasonable close conformity with the lines, grades, dimension, and cross sections shown on the Plans.

218.2-MATERIALS:

Materials shall meet the requirements specified in the following Sub-sections of Division 700:

MATERIALS	SUBSECTION
Cement for Grout	701.1 or 701.3
Sand for Grout	702.1.1 through 702.1.5 and 702.6, or 702.2
Stone for Riprap	704.2
Stone for Gabions	704.3
Gabions	715.23
Reinforcement	709.3, 709.4
Shot Rock	704.8
Engineering Fabric for Erosion Control	715.11

The stone for crushed rock slope protection shall meet the requirements of 704.6, Class 7, except 704.6.3. Acceptance will be on the basis of the producers written certification the material meets the requirements. The certification for Class 7 material shall include a description of the crushing operation indicating the screens used. An alternate to this gradation shall be AASHTO size No. 1. Certified test data from the producer showing the AASHTO No. 1 material meets the gradation requirements of 703.4, when tested from samples obtained at a minimum frequency of one sample per half day of stockpiling, and does not exceed a weighted loss of 30 percent when subjected to five cycles of the Sodium Sulfate Soundness Test, ASTM C 88, will be acceptable.

Stone for foundation protection shall conform to the requirements of riprap

218.3

stone, except for size and shape.

CONSTRUCTION METHODS

218.3-SLOPE PROTECTION:

218.3.1-General: The slopes to be revetted shall reasonably conform to the lines, grades, dimensions, and cross sections as shown on the Plans, unless otherwise directed.

The placing of riprap or grouted riprap shall start in a trench, the invert of which is parallel to and 2 ft. (600 mm) below the toe of the slope, and the trench shall be 2 ft. (600 mm) in width. The construction shall progress from the invert of the trench up the slope to conform to the requirements specified.

Slope protection with crushed rock, concrete slabs, or precast concrete blocks shall start at a concrete bottom sill, shall be included within side sills, and shall progress upward to the berm in front of the abutment. The design and dimensions of the sills shall be as shown on the Plans. The area of the sills shall be considered a part of the area of the slope protection. The concrete sills may be precast or cast-in-place and shall be placed in a trench excavated to receive them. Concrete used in the sills shall meet the requirements specified in [218.3.6.2](#).

Construction equipment shall not operate directly on engineering fabric. The fabric shall be protected from detrimental contamination by surface runoff. Any fabric so contaminated shall be removed and replaced with uncontaminated fabric.

Weep holes shall be provided as directed by the Engineer when grouted riprap, concrete slab, or concrete block slope protection is specified.

218.3.2-Riprap: Riprap shall be composed of stones having the dimensions specified, each stone being firmly bedded on the slope in such a manner that it abuts against other stones to form a layer, the interstices of which are filled with suitably sized spalls. The dimensions of each stone in a plane parallel to the plane of the slope shall be not less than 3 in. by 12 in. (75 by 300 mm) Unless otherwise specified, the longer dimension shall be placed horizontally. The surface of each stone shall not vary more than 3 inches (75 mm) from the specified surface plane. Abutting stones shall have depths not different by more than 1-½ in. (40 mm). The average depth of the stone placed in the riprap shall be not less than the specified depth of the riprap. The first row of stone shall be firmly bedded on the invert of the trench so as to form a firm foundation, and the construction shall progress up the slope by fitting additional and abutting stones with well broken joints and in such a manner that the most compact mass of riprap is developed.

218.3.3-Grouted Riprap: Grouted riprap shall be as defined in [218.3.2](#) with the interstices filled with spalls and grouted with cement grout. The grout filler shall be composed of a mixture of one part portland cement and three parts sand, mixed with water to produce a workable consistency. The amount

of water shall be that designated by the Engineer. The stone shall be thoroughly wet immediately before grout is applied. As soon as the grout is deposited on the surface, it shall be thoroughly worked into the joints. The stones shall then be brushed so that their top surfaces are exposed.

Grouted riprap shall be cured in accordance with any of the methods specified in 501.15, with a blanket of earth kept wet for 72 hours, or by sprinkling with a fine spray of water every two hours during the day-light hours for a period of three days.

218.3.4-Gabions: Gabions, consisting of galvanized wire mesh baskets filled with rocks, shall conform to these Specifications and the dimensions shown on the Plans.

Assembling of the gabion units and their filling with rock shall be carried out as directed by the Engineer. The visible faces of the baskets shall be hand placed to insure an attractive appearance, and the core of the baskets may be filled by mechanical equipment.

218.3.5-Crushed Rock Slope Protection: The thickness of crushed rock slope protection shall be as indicated on the Plans. The rock shall be raked in place to obtain a reasonably smooth and continuous surface conforming to the thickness and slope lines indicated on the Plans.

218.3.6-Concrete Slope Protection:

218.3.6.1-General: Concrete slope protection may be by cast-in-place concrete slab or precast concrete blocks; only one method shall be used at any one bridge.

218.3.6.2-Cast-in-Place Concrete Slab: Concrete slabs shall be not less than 6 inches (150 mm) thick, shall be reinforced with Type B Fabric, and shall conform to the applicable provisions of 501, unless otherwise indicated. Transit mix concrete will be permitted. A wood float finish will be acceptable.

Construction joints shall be provided at intervals of 10 ft. (3 meters) in both directions. Class B Concrete, meeting the requirements of 601 may be used in lieu of the concrete provided above.

218.3.6.3-Precast Concrete Blocks: Precast concrete blocks shall conform to the applicable provisions of 601 and shall be made of Class B concrete, reinforced with Type B fabric. The blocks shall be 3 by 1½ ft. and 4 in (1000 by 500 by 100 mm) thick. The longer dimension shall be placed on a horizontal plane. The blocks shall be firmly embedded against the slope and against adjoining blocks, with the ends in contact. The finished surface shall present an even, tight surface, reasonably true to line, grade, and section.

218.3.7-Engineering Fabric:

218.3.7

218.3.7.1-Fabric Placement: The area in which the fabric is to be installed shall be prepared in a relatively smooth state, free of sharp protrusions, depressions and debris. The machine direction of the fabric shall generally be placed parallel with the direction of major water flow, i.e., parallel to the stream or as authorized by the Engineer. The fabric shall be placed in a relatively loose and unstretched condition such that the fabric and underlying material deforms slightly under riprap weight when placed. Fastener pins shall be placed to prevent displacement of the fabric.

The fabric shall be field sewn as described in 715.11.3 or overlapped. When the overlapping technique is used, an overlap of 3 ft. (900 mm) shall be maintained so the upgrade fabric shall always be lapped over the downgrade fabric.

218.3.7.2-Cover Material Placement: Extreme care shall be exercised in placing cover material over the fabric, especially when riprap is used. Under no circumstances shall heavy angular stone, such as riprap, be dropped on the fabric from more than 1 ft. (300 mm) in height. A cushioning layer of sand or gravel may be placed between the fabric and riprap, providing this material does not inhibit free drainage of the slope.

All cover material shall be placed from downslope to upslope in such a manner as to prevent slippage of the cover material off the fabric.

218.4-FOUNDATION PROTECTION:

The area around piers, abutments or other foundations shall be excavated to a depth and width indicated on the Plans, or as otherwise directed.

Stone for foundation protection shall be largely equidimensional, angular, and generally ranging in size between one cubic foot (300 cubic millimeters) and one cubic yard (meter). The stone need not be placed, but may be dumped from trucks or bulldozed in place. The stone shall be placed where indicated on the Plans or as directed by the Engineer.

218.5-METHOD OF MEASUREMENT:

Except for "Shot Rock" which will be measured in tons (Mg), the quantity of work done under Slope Protection will be measured in cubic yards (meters) of "Riprap", "Grouted Riprap", or "Gabions", and in square yards (meters) of "Crushed Rock Slope Protection", "Concrete Slope Protection" or "Fabric for Erosion Control", excluding overlaps.

The number of tons (Mg) of "Shot Rock" shall be determined by the total of the weights shown on receipted railroad freight bills when materials are shipped by rail; by actual measured displacement of barges certified by the producer when water shipments are made, providing materials delivered by the methods are not stockpiled or stored; or determined by the Contractor from the total of weigh slips for each vehicle load weighed on an approved truck scale, and certified by the Contractor to be correct.

Truck scales shall be provided by the producer or Contractor. The scales shall be of sufficient size and capacity to weigh the heaviest loaded trucks that

are used for delivery of the material.

All truck scales shall be mounted on solid foundations which will insure their remaining plumb and level. All truck scales shall be inspected and sealed by the West Virginia Division of Labor, Bureau of Weights and Measures, or other appropriate agencies of the State or its political subdivisions. The Division may, at its option, accept inspection and sealing by out of state agencies when the material is weighed outside West Virginia.

A digital recorder shall be required on all truck scales. The digital recorder shall produce a printed record of the gross, tare and net weights, and the time, date, truck identification and project number. Provisions shall be made for constant zero compensation and further provision shall be made so that the scales may not be manually manipulated during the printing process.

The system shall be interlocked so as to allow printing only when the scale has come to rest. In case of a breakdown of the automatic equipment, the Engineer may permit manual operation for a reasonable time, normally not to exceed 48 hours, while the equipment is being repaired.

Each truck shall be weighed empty prior to each load.

A weigh person shall be provided by the producer. The weigh person shall certify that the weight of the material, as determined either by the truck scales or from the digital printout of the weights, is correct.

Area dimensions will be based on slope measurement; concrete sills will be included in the area measurement for crushed rock or concrete slope protection. Volumes may be determined by verified plan dimensions or from measurements of the completed work, as authorized by the Engineer. The quantity of work done under "Foundation Protection" will be measured in cubic yards (meters), actually produced and incorporated in the work, determined in its original position from cross sections by the method of average end areas, unless otherwise authorized by the Engineer.

218.6-BASIS OF PAYMENT:

The quantities, determined as provided above, will be paid for at the contract unit prices bid for these items, which prices and payments shall be full compensation for excavating and preparing the embankment or slope, footing and sill trench; furnishing all the materials, including steel reinforcement; and doing all the work prescribed in a workmanlike and acceptable manner, including all labor, tools, equipment, supplies, and incidentals necessary to complete the work.

218.7-PAY ITEMS:

ITEM	DESCRIPTION	UNIT
218001-*	RIPRAP	CUBIC YARD (METER)
218002-*	GROUTED RIPRAP	CUBIC YARD (METER)
218003-*	GABION	CUBIC YARD (METER)
218004-*	"thickness" CRUSHED ROCK SLOPE PROTECTION	SQUARE YARD (METER)
218005-*	CONCRETE SLOPE PROTECTION	SQUARE YARD (METER)
218006-*	FOUNDATION PROTECTION	CUBIC YARD (METER)
218007-*	FABRIC FOR EROSION CONTROL	SQUARE YARD (METER)
218008-*	SHOT ROCK	TON (MEGAGRAM)

*Sequence number

SECTION 219

CONTROLLED LOW-STRENGTH MATERIAL

219.1-DESCRIPTION:

A Controlled Low Strength Material (CLSM) is a non-compacted, cementitious material used primarily as a backfill in lieu of a compacted material.

This work shall consist of furnishing and placing CLSM as a backfill material in accordance with these Specifications and in reasonably close conformity with the lines, grades, thicknesses and cross sections shown on the Plans or established by the Engineer.

219.2-MATERIALS:

Materials shall meet the requirements specified in the following Subsections of section 700.

Material**Subsection**

Flyash :	707.4.1 (except with a maximum loss on ignition of 12%)
Portland Cement:	701.1 or 701.3
Aggregate:	
1. Bottom Ash:	703.3.3 (except with the following gradation and a maximum loss on ignition of 12%):

Sieve Size

¾ inch (19 mm)
 3/8 inch (9.5 mm)
 #100 (150 µm)

Percent Passing by Weight:

95%
 85-100%
 0 – 25%